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Hepatic myelolipomas in *Callimico goeldii* (Thomas, 1904) kept in captivity

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Abstract

Myelolipoma is an unusual benign neoplasm in veterinary medicine. This work intended to report the occurrence of hepatic myelolipomas in Neotropical primates of the *Callimico goeldii* species kept in captivity. These cases were diagnosed during necropsy in a survey on liver neoplasms in the period of 2004 to 2008. Two cases were found in adult male, and two in adult female animals. The diagnoses were obtained through data analysis of necropsy records, pathological examination of the cases, and histological confirmation. Three (75%) of the animals showed clinical signs of progressive weight loss, and two (50%) of them exhibited regional abdominal bloating. The livers had protrusions of pale yellow color on the surface of all lobes. Histologically, the tumors were formed by mature myeloid tissue with high hematopoietic cellularity, represented by the megakaryocytes and meroblastic cells and immature erythroblasts. We conclude that non-human primates of the *Callimico goeldii* species might have predisposition for liver myelolipoma, which are neoplasms that can lead to the failure and destruction of this organ.

Key words: neotropical primates, Goeldi's Marmoset, monkey, neoplasia, myelolipoma.

Introduction

Myelolipoma is a rare benign neoplasm that has a myeloid tissue (1). It is unusual in veterinary medicine, and it is often described as an incidental finding in the liver, adrenal gland, and spleen of old age animals (13). Moreover, it can simultaneously occur in more than one organ in some cases (6).

This type of neoplasia is endocrinologically inactive and does not manifest any obvious clinical symptoms. The diagnosis is usually obtained in terminally ill animals. Histologically, it comprises a mix of mature lipocytes and hematopoietic cells (2).

In non-human primates, Kakinuma and partners (6) reported the occurrence of myelolipoma in common marmoset (*Callithrix jacchus*); and Lowenstine (10) reported that this neoplasm is occasionally found in specimens of Callitrichidae, and its pathogenesis is unknown. Other cases of hepatic myelolipoma in *Callimico goeldi* were described above in animals kept in captivity in other countries such as Switzerland (3), Japan (12) and the United States (cases in Florida (4) and Chicago Zoo (8)) and in the State of São Paulo, Brazil (9).

Nevertheless, genetic characteristics and environmental conditions, including diet, represent possible factors responsible for the high incidence of myelolipoma in *Callimico goeldii* (12).

Thus, this work intended to report the occurrence of hepatic myelolipomas in Neotropical primates of the *Callimico goeldii* species (Goeldi's Marmoset) kept in captivity at the National Primate Centre (CENP) of Ananindeua, Pará, Brazil.

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Material and methods

A retrospective survey on cases of liver cancer, with diagnoses determined by autopsy and histopathological examination, was conducted in 2004 to 2008 on primates held in captivity at the National Primate Centre (CENP) of Ananindeua, Pará, Brazil (1°38'26"S and 48°38'22"W). During the period, 213 necropsies were performed on different species of neotropical non-human primates. Of all species, hepatic myelolipomas were observed only in *Callimico goeldi*, occurring in four of five specimens (2 adult males and 2 adult females). This study is part of the research project "Anatomopathologic investigation of pathological conditions and illnesses occurring in non-human primates" that was approved by the Ethics Committee on Animal Research (CEPAN) under nº. 0007/2004.

The necropsy records were catalogued, and cases containing descriptions of clinical symptoms, animal general condition, and macroscopic aspects indicating liver cancer were selected.

The diagnostics were confirmed after analysis of the data from the necropsy records, followed by a histological review of the cases, and photomicrographic records. Simple percentage was used for statistical analysis.

Results and Discussion

Three (75%) of the animals showed clinical signs of progressive weight loss (2 females and 1 male), two (50%) exhibited regional abdominal bloating (2 females), and no other clinical signs associated to this neoplastic disease were found. According to Kleinschimidt et al. (8), the absence of symptoms is common in animals with liver myelolipoma; these symptoms are usually detected when the disease is at an advanced stage.

Gross analysis of the liver showed protrusions of brownish color and multifocal white nodules of 1 mm to 3.5 cm in diameter (Fig. 1A), and elastic consistency. Two animals presented several coalescent nodules. Narama and collaborators (12) reported tumors of 2 mm to 1 cm in diameter smaller than the ones found in the present study. This variation may be related to the progressive stage of the tumor.

One of the animals with regional abdominal bloating (Fig. 1B) had a substantial development of the neoplasm, which replaced about 70% of the hepatic parenchyma, and showed multiple coalescent nodules (Fig. 1C). Its liver was sectioned and the tumors were found in the deep portions of the tissue, and were poorly outlined and irregular. In addition to the multiple nodules, a second large tumor formation was found in the right lobe of the liver (Fig. 1D).

Similar macroscopic characteristics were described by Kleinschmidt et al. (8) and Raya et al. (13) regarding liver myelolipoma in pets; and presence of hepatic neoplasms in all liver lobes of all studied animals shows that the tumors were multicentral, as also mentioned by Ikede and Downey (5).

Myelolipomas are usually associated with the adrenal gland (11); however, the specimens of *Callimico goeldii* evaluated had occurrences in the liver. Similar cases were reported by Heard et al. (4) in a *Callimico goeldii* and Yamaguchi et al. (14) in a white-lipped tamarin (*Saguinus labiatus*) with an associated severe coelomic edema. However, Kakinuma et al. (6) found occurrences of this neoplasm in both adrenal and liver tissues of a common marmoset.

Histologically, the neoplasia was formed by mature myeloid tissues with large hematopoietic cellularity, represented by megakaryocytes, myeloblastic cells and immature erythroblasts (Fig. 1E and 1F), corroborating the findings of several authors (1, 7, 8). Areas of fibrosis were observed in more peripheral areas of the tumor due to the destruction and loss of liver parenchyma; similar changes were described by Ikede and Downey (5) in a cat with multiple adrenal myelolipomas.

Additional tests such as X-ray and ultrasound may be useful as an ancillary diagnosis for several cancers, however, the animals in this study died before the tumor was discovered, mainly because of the unclear symptoms. Moreover, according to Heard et al. (4), myelolipomas can have little effect on the liver's biochemical indicators, and its diagnosis can be cytologically confused with extramedullary haematopoiesis.

Kleinschmidt et al. (8) demonstrated that there was no significant difference between affected and nonaffected individuals, suggesting that genetics are not a determining factor in development of myelolipoma in *Callimico goeldii* and animals found to have a slightly higher risk of developing hepatic myelolipomas include older and female.

Conclusions

Neotropical primates of the species *Callimico goeldii* are predisposed to developing myelolipomas. The clinical signs are non-specific, but may occur progressive distension abdominal and the neoplasm may be the cause of death in individuals of this species.

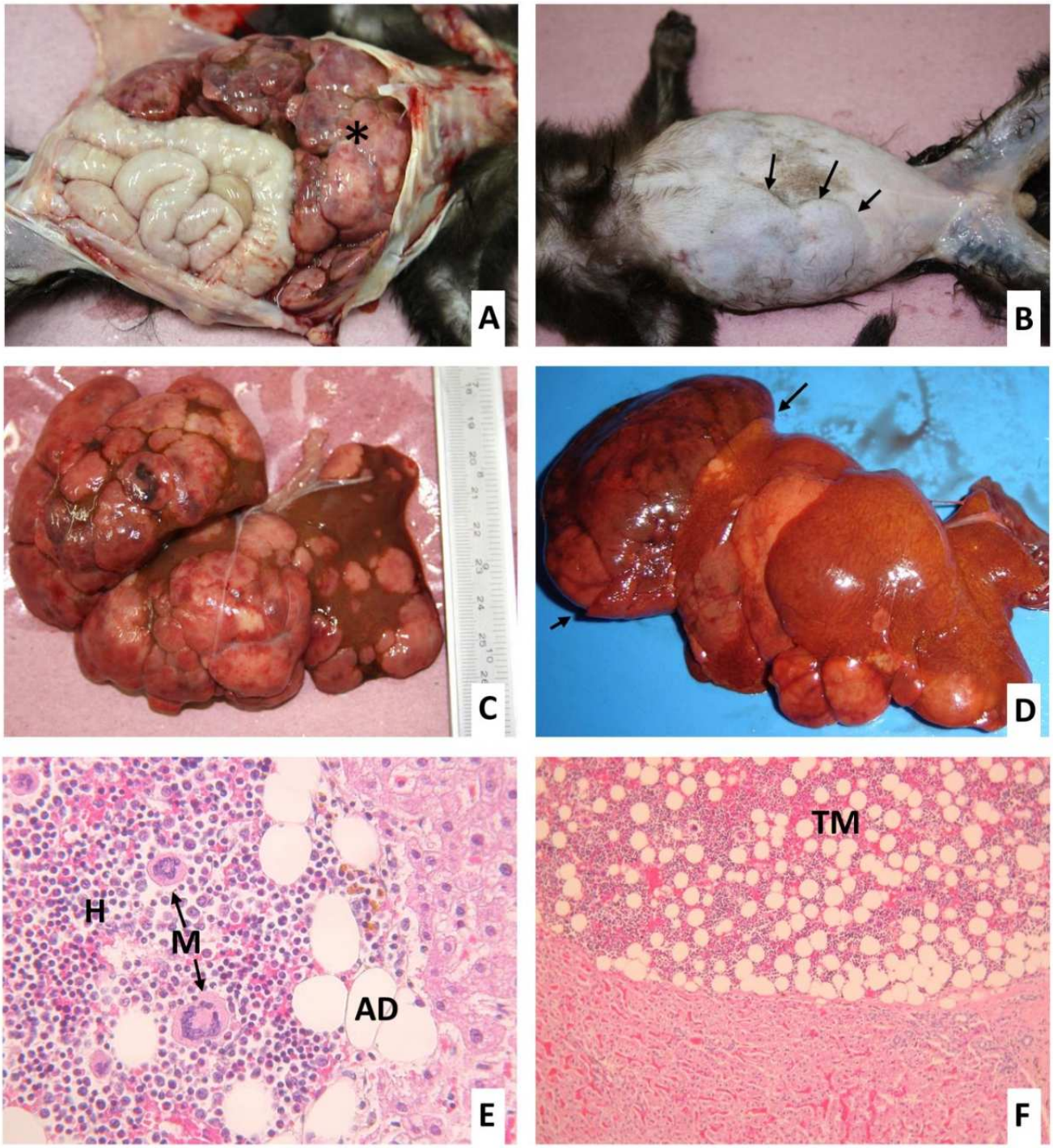


Figure 1. Liver myelolipoma in *Callimico goeldii*. **A.** Opened abdominal cavity showing the liver with protrusions of brownish color (*). **B.** Presence of abdominal distension and marking of tumor growth, especially on the right side (arrows). **C.** Liver with multiple tumors, some of which coalescing, occupying approximately 70% of the organ. **D.** Presence of extensive tumor nodulation with stalky aspect (arrows). **E.** Proliferation formed by mature adipocytes (MA) and hematopoietic cells (HC), megakaryocyte (M), and some hemosiderin-laden macrophages. (HE 400x). There is only Myeloid tissue (MT) in the image. **F.** Myeloid tissue (MT) widely replacing the hepatic parenchyma. (HE, 100x).

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